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Kinetics of dermal uptake of nicotine from air

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Abstract: Recently, dermal uptake of nicotine from cigarette smoke has been observed. To study this process in more detail, six participants were exposed to nicotine in a chamber over a 5-hour period while breathing clean air through a breathing hood. During the first week four of the participants wore only shorts and two wore a set of clean clothes comprised of cotton, polyester and rayon (average air concentration of nicotine 240 µg/m³). During the second week, two of the bare-skin participants were again exposed in the chamber (average nicotine concentration 290 µg/m³). The two participants who wore clean clothes on week one, were now exposed wearing a shirt, socks and gloves that had been exposed to nicotine at an air concentration of ~500 µg/m³ for 16 days, then ~250 µg/m³ for 11 days. They wore full-length pants that had been laundered but not exposed. One urine sample was collected immediately before exposure and all urine was collected during the 84 hours after each exposure. Post-exposure urine samples were pooled; one pooled sample contained urine collected within the first 12 hours after exposure, the second, third and fourth pooled samples contained urine collected during the subsequent three 24-hour periods. All urine samples were analysed for nicotine and two of its metabolites, cotinine and 3-hydroxycotinine. For three of the participants, all individual (non-pooled) samples from both weeks were analysed. The average back-calculated absorbed nicotine for bare-skinned subjects was 590 mg, less than 55 mg for subjects wearing fresh clothes and 810 mg for subjects wearing exposed clothes. The average cotinine half-life was 35h, which is greater than the reported half-life for intravenous delivery (14h), smokers (16h) or non-smokers exposed to ETS (27h). These observations are consistent with the hypothesis that non-smokers exposed to ETS are absorbing some fraction of nicotine through their skin.

Keywords: A-indoor environment, A-biomonitoring, A-second-hand smoke, B-VOCs, C-air